committee were doubtless full of interest and information to the members, it unfortunately happens that the Report will not contribute anything substantial towards a solution of the desperate problem with which the country remains confronted.

A War Memorial.

The Scientific Papers of Bertram Hopkinson. Collected and arranged by Sir J. Alfred Ewing and Sir Joseph Larmor. Pp. xxvii + 480 + plates. (Cambridge: At the University Press, 1921.) 63*s*. net.

BERTRAM HOPKINSON'S scientific friends, including his Cambridge staff, decided well when they determined that no memorial could be more suitable or permanent than a collected edition of his writings on mathematical and engineering science. The editors and the syndics of the Cambridge University Press alike have earned our thanks by the manner in which their shares of the publication have been carried out.

There is no need to tell at length the tragic story of his life. Called home from Aden in 1898 by the death of his father, brother, and two sisters on the Dents de Veisivi, he took up his father's work as a consulting engineer with the aid of his uncle Charles, and carried out various important undertakings. Five years later he became professor of mechanism at Cambridge, and in the same year he married. For the next eleven years he was fully occupied in the development of the work of his chair. The papers in the volume under review form his contributions to science during that time, but they do not constitute by any means the whole of the debt we owe to him. To quote from Prof. A. V. Hill's appreciation in the *Alpine Journal,* at Cambridge

> "a professor of mechanism can hope to make a school essentially in touch with the traditions of the place only on condition that his interests are largely, if not mainly, scientific. In Hopkinson Cambridge had an ideal professor, and the pupils trained in his school have already, especially during the war, raised a memorial to him by their work."

The war, when it came, claimed him at once, at first as a teacher at Chatham, then at the Admiralty, where he conducted some most important experiments which led to the modern methods of protection of large ships against torpedoes. Finally he joined the Royal Air Force as an officer in charge of experimental work of all kinds, becoming in June, 1918, Deputy Controller of the Technical Department; on August 26 of that year he was killed in a flying accident.

The papers in the volume fall naturally into three main groups, dealing respectively with electrical engineering, with certain metallurgical questions, and with the problems of the internal-combustion engine. In addition, the first paper of the series, one on sources and vortices, which was contributed to the London Mathematical Society in 1898, deserves mention as indicating the width of his knowledge and interests. He was an electrical engineer by profession; his father had placed the construction of electrical machinery on a scientific basis by the paper on dynamo-electric machines written in conjunction with his uncle Edward, and published in the Phil. Trans., and it was not unnatural that the son's early work as professor should deal with similar problems.

His first paper in the Proceedings of the Royal Society on the shunting of alternate-current machines gave a satisfactory explanation of the phenomenon, and seems to have been inspired in part by the behaviour of a small machine in the Wimbledon Power House near his home.

Electrotechnics did not for long retain his main attention. Papers on the elastic properties of steel at high temperatures, brittleness and ductility, and the endurance of metals under alternating stresses of high frequency, followed during the next few years, and each served to bring out his versatility and his power of getting at the heart of a subject and of explaining in clear and concise language the results of his investigations.

Two remarkable papers on the magnetic properties of iron and its alloys in strong magnetic fields, and on manganese steels, were published with Sir Robert Hadfield in 1911 and 1914, and have added greatly to our knowledge of magnetism. Hopkinson was able to show that the magnetism of saturation might, in the case of the carbon steels, be predicted from the composition by treating each steel as a mixture of iron and of less magnetisable carbide. With manganese, however, no such simple relation was found to follow.

The work, however, by which Hopkinson will probably be best remembered is that on the internal-combustion engine. It began with a British Association paper in 1904, which led in 1907 to an investigation into the efficiency of the gas engine; in the course of this research the well-known Hopkinson indicator was developed, and it was shown that indicator diagrams, properly drawn, could be used satisfactorily for the measurement of efficiency. In 1906 a most im-

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portant paper on the distribution of temperature in an explosion cylinder was communicated to the Royal Society, and the discussion aroused on these matters led to the formation of the Gaseous Explosions Committee of the British Association, of which Sir Dugald Clerk was chairman, and Hopkinson secretary. Much, probably most, of our recent knowledge of the theory of the internal-combustion engine has sprung from the labours of that committee, and to the advance made Hopkinson was a most important contributor. It is sufficient, perhaps, to mention his last paper on the subject, "On Radiation in a Gaseous Explósion," communicated to the Royal Society in 1910; the work thus begun has recently been brought to a most satisfactory conclusion by his pupil and assistant, Mr. W. T. David. In conclusion, reference should be made to a lecture at the Royal Institution, 1912, on "The Pressure of a Blow," and to the Royal Society paper on "A Method of Measuring the Pressure due to the Detonation of High Explosives," which led in a simple way to results of marked interest.

Enough has probably been written to show the high value of the work Hopkinson did, and the magnitude of the loss to engineering science caused by his early death. To quote the words of Sir J. J. Thomson, speaking as Master of Trinity in a commemorative address, "our roll of honour contains the name of no one who has rendered greater services to his country."

The New Medicine.

The Principles of Preventive Medicine. By Prof. R. T. Hewlett and Dr. A. T. Nankivell. Pp. viii + 536. (London: J. and A. Churchill, 1921.) 21*s.* net.

THE object of Prof. Hewlett and Dr. Nankivell in writing this book was to give an outline of the principles and practice of preventive medicine "so far as it seems to concern the medical student and the general practitioner of medicine." That there was need for such a book there is no doubt. All who are concerned in any way with the teaching or practice of public health and preventive medicine certainly must agree that such a book was required, just as they must agree that this volume by Prof. Hewlett and Dr. Nankivell goes some distance towards supplying the need. The preparation of the book, the authors admit, gave considerable trouble, the extent of the field to be covered rendering it difficult to decide what to include and what to omit. In all book-making this is always a difficult thing, but in this case the authors have chosen wisely, and in the twenty-one chapters and three appendices they appear to have made reference to all the more important matters in respect of which the medical student and the practitioner—who, after all, are expected to play a great part in the preventive medicine of the future—need information.

As might be expected in a book prepared by two practical men like Prof. Hewlett and Dr. Nankivell, one a distinguished bacteriologist, and the other a Medical Officer of Health of some years' standing, the information given is trustworthy. Here and there in the writing, however, there is shown a tendency to leave the lines followed in the ordinary medical books, and to indulge in what may almost be called "flights of fancy." In a number of places the authors appear unable to avoid the temptation to drop into poetry, and to provide word-pictures in which they use much more colour than appears to be essential in a book intended for such dispassionate readers as medical students and practitioners are, or should be. The chapters in which the fancifulness and the over-drawing are most frequently to be met are, curiously enough, those in which serious writing and strict accuracy of expression are most called for—viz. those dealing with housing, infancy, motherhood, and school children—and though there may be some who will appreciate the picturesque and exaggerated phrasing at its true value and find it helpful, it seems not unlikely that more will regard it as objectionable and out of place. In any case, it seems unfortunate that in one of the first books on preventive medicine the line here chosen should have been taken, and the impression given that the subject is one which is most suitably dealt with in a style more popular than scientific.

In the chapters dealing with infectious diseases the authors have exercised greater restraint and provided an amount of interesting, useful, and sound information. These chapters are amongst the most valuable in the book, and are particularly noteworthy for a declaration against the tendency to search out and find specific germs of disease, and more or less in favour of the view that, since they can be shown to change their shape and even their virulence on occasion, there is no such thing as constancy among micro-organisms. It is not, therefore, too much to suppose them capable of undergoing such transformations as will allow them to produce one type of disease at one time and another of an associated type at some other time. Another excellent chapter—although by the medical student and practitioner it may be regarded as rather more full of arithmetic and mathematics than is absolutely essential—is that on vital statistics. Amongst readers

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